

Figure 1 – Starting sequence used for the codon modification of MUC1. The MUC1 expression cassette sequence is taken from the vector JNW656. Start and stop codons are bolded. Kozak sequence is italicised. Restriction sites are underlined.

5 **GCTAGCGCCACCATGTCTAGAACACCGGGCACCCAGTCTCCTTCTCCTGCT**
 GCTGCTCCTCACAGTGCTTACAGTTGTTACAGGTTCTGGTCATGCAAGCTCTAC
 CCCAGGTTGGAGAAAAGGAGACTTCGGCTACCCAGAGAAGTTAGTGCAGTGCCAGCT
 CTACTGAGAAGAATGCTGTGAGTATGACCAGCAGCGTACTCTCCAGGCCACAGcC
 CCGGTTCAGGCTCCTCCACCACTCAGGGACAGGGATGTCACTCTGGCCCCGGCC
 10 ACGGAACCAGCTTCAGGTTCAGCTGCCACCTGGGGACAGGGATGTCACTCTGGCCCCGGCT
 CCCAGTCACCAGGCCAGCCCTGGGCTCCACCACCCGCCAGCCCACGATGTC
 ACCTCAGCCCCGGACAACAACAAGCCAGCCCCGGCTCCACCACGGCCCCCAGCCC
 ACGGTGTCACTCGGCCCCGGACACCAGGCCGGCCCCGGCTCCACCGCC
 CCCAGCCCACGGTGTCACTCGGCCCCGGACACCAGGCCGGCCCCGGCTCC
 15 ACCGCCCCCCCAGCCCACGGTGTCACTCGGCCCCGGACACCAGGCCGGCC
 CGGGCTCCACCGGCCCCCCCAGCCCACGGTGTCACTCTGGCCCCGGACACCAG
 GCCCGCCCCGGCTCCACCGGCCCCCCCAGCCCACGGTGTCACTCTGGCCCCG
 GACACCAGGCCGGCCCCGGCTCCACCAGCGGCCAGCCCACGGTGTCACTCTGGCCCCG
 CGGCCCCGGACACCAGGCCGGCCCCGGCTCCACCAGGCCACGGTGTCACTCTGGCCCCG
 20 GTGTCACTCGGCCCCGGACACCAGGCCGGCCCCGGCTCCACCAGGCCACGGCCCCG
 AGCCCATGGTGTCACTCTGGCCCCGGACACAGGCCGCCCTGGGCTCCACCAGGCCACGG
 GCCCCTCCAGTCCACAATGTCACCTCGGCCTCAGGCTCTGCATCAGGCTCAGC
 TTCTACTCTGGTGCACAACGGCACCTCTGCCAGGGTACCAACACCCAGCCA
 GCAAGAGCACTCCATTCTCAATTCCAGCCACCACTCTGATACTCCTACCAACCC
 25 TTGCCAGCCATAGCACCAAGACTGATGCCAGTAGCACTCACCATAGCACGGTA
 CCTCCTCTCACCTCTCCAATCACAGCACTTCTCCCCAGTTGTCTACTGGGTC
 TCTTCTTTTCTGTCTTACATTCAAACCTCCAGTTAATTCTCTCTGGA
 AGATCCCCAGCACCGACTACTACCAAGAGCTGCAGAGAGACATTCTGAAATGTT
 TTTGCAGATTTATAAACAAAGGGGTTTCTGGGCCTCTCCAATATTAGTTAG
 30 GCCAGGATCTGTGGTGGTACAATTGACTCTGGCCTCCGAGAAAGGTACCATCA
 ATGTCCCACGACGTGGAGACACAGTTCAATCAGTATAAAACGGAAGCAGCCTCTC
 GATATAACCTGACGATCTCAGACGTCAGCGTGAGTGATGTGCCATTCTTCT
 CTGCCCCAGTCTGGGCTGGGTGCCAGGCTGGGCATCGCGCTGCTGGTGT
 GGTCTGTGTCTGGTGCCTGGCCATTGTCTATCTCATTGCCCTGGCTGTCTG
 35 TCAGTGCCCGCCGAAAGAACTACGGGCAGCTGGACATCTTCCAGCCCAGGATA
 CCTACCCATCCTATGAGCGAGTACCCACCTACCAACCCATGGGCCTATGTG
 CCCCTAGCAGTACCGATCGTAGCCCCTATGAGAAGGTTCTGCAGGTAATGG
 TGGCAGCAGCCTCTTACACAAACCCAGCAGTGGCAGCCACTTCTGCCAACTT
GTCTAGATAGCTCGAG

40

Figure 2 – MUC1 sequence devoid of the 7x VNTR repeat sequence, prior to codon modification. The start and stop codons are bolded. Restriction cloning sites are underlined. The BpI and BbvCI sites for insertion of the 7x VNTR fragment are double underlined.

5

ATGTCTAGAACACCGGGCACCCAGTCTCCTTCTTCCTGCTGCTGCTCCTCACA
GTGCTTACAGTTACAGGTTCTGGTCATGCAAGCTCTACCCCCAGGTGGAGAA
AAGGAGACTTCGGCTACCCAGAGAAGTTAGTGCAGTCCCCAGCTACTGAGAAGAA
TGCTGTGAGTATGACCAGCAGCGTACTCTCCAGCCACAGCCCCGGTTCAGGCT
CCTCCACCACACTCAGGGACAGGATGTCACTCTGGCCCCGGCCACGGAACCCAGCT
TCAGGTTCAGCTGCCACCTGGGGACAGGATGTCACCTCGGTCCCAGTCACCAG
GCCAGCCCTGGGCTCCACCACCCGCCAGCCCACGATGTCACCTCAGCCCCG
GACAACAAGCCCAATGTCACCTCGGCCTCAGGCTCTGCATCAGGCTCAGCTTC
TACTCTGGTGACAACGGCACCTGCCAGGGTACCAACAACCCCAGCCAGCA
AGAGCACTCCATTCTCAATTCCCAGCCACCACTCTGATAACTCCTACCACCCTTG
CCAGCCATAGCACCAAGACTGATGCCAGTAGCACTCACCATGACGGTACCT
CCTCTCACCTCCTCCAATCACAGCACTTCTCCCCAGTTGCTACTGGGGTCT
TTCTTTTCTGTCTTTCACATTCAAACCTCCAGTTAATTCTCTCTGGAAAGA
TCCCAGCACCGACTACTACCAAGAGCTGCAGAGAGACATTCTGAAATGTTTT
GCAGATTATAAACAAAGGGGTTTCTGGGCCTCTCCAAATTAAGTTCAGGCC
AGGATCTGGTGGTACAATTGACTCTGGCCTCCGAGAAGGTACCATCAATGT
CCACGACGTGGAGACACAGTTCAATCAGTATAAAACGGAAAGCAGCCTCTCGATA
TAACCTGACGATCTCAGACGTCAGCGTGAGTGATGTGCCATTCCCTCTGC
CCAGTCTGGGCTGGGTGCCAGGCTGGGGCATCGCGCTGCTGGTCTGGTC
TGTGTTCTGGTTCGGCTGGCCATTGTCTATCTCATTGCCTGGCTGTCTGTCAG
TGCCGCCGAAAGAAACTACGGGCAGCTGGACATCTTCCAGCCCGGGATACCTA
CCATCCTATGAGCGAGTACCCACCTACCACACCCATGGCGCTATGTCCCC
CTAGCAGTACCGATCGTAGCCCCTATGAGAAGGTTCTGCAGGTAATGGTGGC
AGCAGCCTCTCTTACACAAACCCAGCAGTGGCAGCCACTTCTGCCAACTTGTC
AGATAG

Figure 3 – Two representative MUC1 codon modified sequences

Sequence 1

5 ATGAGCCGGACCCCTGGCACCCAGTCTCCATTCTTCTGCTCCTGCTGCTCAC
 CGTCTGACCGTGGTGACGGGAAGCGGCCACGCTTCGTCACGCCGGCG
 GAGAAGGAAACCAGTGCACCCAGCGCAGCTCCGTGCCAGCTCCACCGAGA
 AAAACGCTGTGAGCATGACGTCCAGTGTCTCTAGCCATAGCCCCGGCTCT
 GGGAGCAGTACCAACCCAGGGCCAGGACGTGACTCTCGCCCCGCTACGGAGC
 10 CCGCTTCTGGCTCCGCCACCTGGGCCAGGACGTGACCTCTGTGCCGGT
 CACACGCCCTGCTCTGGCTTACCACTCCTCTGCCATGACGTGACCTCGG
 CTCCGGACAATAAGCCAACGTGACGAGTGCCAGCAGGGAGCGCCTCGGGTC
 CGCCAGTACCCCTGGTGATAACGGGACCAAGTGTAGGGCCACCACCAACCCC
 GCGTCGAAGAGCACCCCCCTCTATCCCGTCTCATCATAGCAGACACACCTACA
 15 ACCCTGGCGAGCCACAGCACCAAGACCGACGCTTCCACACATCATAGCAC
 CGTCCACCACACTACCAGCTCAACCATTCCACAGCCCCCAGCTGAGCACCG
 GAGTGTCTTCTTCCTGAGCTCCATATCAGTAACCTCCAGTTCAACTCCAG
 CCTCGAGGACCCCTTACCGACTACTATCAGGAGCTGCAGCGGGACATCAGCG
 AGATGTTCTGCAGATCTACAAGCAGGGGGCTTCTCGGCCTGTCTAACATCA
 20 AGTTCCGCCCCGGCAGCGTCGTGGTGAGTTGACCCCTGGCCTTCCGGAGGG
 CACCATCAACGTGCACGACGTGGAGACCCAGTTCAACCAGTACAAGACCGAGG
 CCGCCAGCAGGTATAACCTGACCATCTCCGACGCTCTGTGAGCGACGTCCCC
 TTCCCTTCTCCGCCAGAGCGGGCTGGGTGCCGGCTGGGCATCGCT
 TGCTCGTGTGGTGTGCCTGGCTGGCCATCGTGTACCTGATCGCC
 25 CTGGCCGTCTGTCAATGCAGGCCAAGAACTACGGCCAGCTGACATCTTCCC
 AGCTGGGATACCTATCATCCCATGAGCGAGTACCCACCTACCACACCCATG
 GCCGCTACGTTCCCTCCAGCACCGACCGCAGCCCTACGAGAAGGTGAGC
 GCCGGGAATGGGGGAGTTCTCTCTTACACAAACCCGCCGTGGCCGCCA
 CGAGCGCCAACCTCTCCAGGTGA
 30

Sequence 2

ATGTCCCGCACCCCTGGCACCCAGTCCCCCTTCTTCTCCTGCTGCTGCTCAC
 GTGCTGACCGTCGTGACCGGAGTGGCATGCGTCTCGACGCCGGCGCG
 35 AGAAGGAGACCAGTGTACCCAGCGCAGCTCTGTGCTTCAGCACGGAGAAG
 AACGCTGTGAGTATGACTTCTCCGTGCTGAGCTCCATAGCCCCGGCTCGGG
 CAGCTCCACCACCCAGGGCAGGACGTGACACTGGCTCCCGCAACCGAGCCC
 GCCTCTGGCTCTGCCGCCACCTGGGCCAGGACGTGACATCCGTGCCGTGA
 CCCGCCCGCCCTGGCAGCACCAACCCCCCTGCTCATGACGTACCTCTGC
 40 GCCTGACAACAAGCCTAACGTGACGTCCGCTTCCGGCAGCGCCTCCGGTCC
 GCCTCCACACTGGTGCATAACGGAACCTCCCGCGCCACCACCAACCCAG
 CGAGCAAGAGCACCCCTCTATCCCCTCCCATATAGCGACACACCCACCA
 CGCTGGCCAGCCATAGCACCAAAACCGACGCCTCTAGCACCCACCACTCCACG
 GTGCCCTCCAGCAACATTCTACCTCCCCCAGCTGAGCACGG
 45 GGTGAGCTTTCTTCTGCTCTCCATATCAGCAACCTCCAGTTCAATTCTCT
 CTGGAGGACCCAGCACCAGTACTACCAAGAGCTGCAGCGGGACATCTCCGA
 GATTTCTGCAAGATCTACAAACAGGGGGCTTCTGGGATTGAGCAACATCAA
 GTTCCGCCGGTCCGTGGTGGTGAGCTCACCTGGCCTCAGGGAGGGC
 ACCATCAACGTGCATGACGTCGAGACCCAGTTCAATCAGTATAAGACCGAGGC
 50 CGCCTCCGGTACAACCTGACGATCAGCGACGTGTCGTGTCGCCGACGTGCCCT
 TCCCCTCTCCGCACAGTCCGGCGCCGGCTGGGCATCGCCCT

GCTCGTGTGGTGTGCGTGCTCGTGGCCCTGCCATCGTGTACCTGATGCC
TGGCCGTCTGTCAGTGCAGGAGAAAGAACTATGGGCAGTTGGATATCTTCCCC
GCCAGGGACACCTACCACCCATGTCCGAGTACCCCCACCTACCACACCCACGG
5 CCGCTATGTCCCTCCCTCTCGACCGACCGCTCCCCCTTACGAGAAGGTGAGCG
CCGGCAACGGAGGCAGCTCCCTGTCCTACACCAACCTGCCGTGGCCGCCAC
AAGCGCCAACCTGAGCCGCTGA

Figure 4 – Engineered MUC1 codon modified sequence including restriction sites (underlined), Kozak sequence (italicised), start and stop codons (bolded), BbvCI (boxed) and BpI (boxed). The later two features are essential for the re-introduction of the 7x VNTR fragment.

5 GCAGGGCGGCCGCGCTAGGCCACCATGTCTAGAACCCCTGGCACCCAGTCCC
 CCTTCTTCTCCTGCTGCTCACCGTGTGACCGTCGTGACCGGCAGTGGG
 CATGCGTCCTCGACGCCCGCGAGAAGGAGACCAGTGCTACCCAGCGCA
 GCTCTGTGCCTCCAGCACGGAGAAGAACGCTGTGAGTATGACTTCCCTCGTG
 10 CTGTCCTCCCATAGCCCCGGCTGGGCAGCTCCACCACCCAGGGCAGGACG
 TGACACTGGCTCCCGCAACCAGAGCCGCCCTGGCTCTGCCGCCACCTGGGG
 CCAGGACGTGACATCCGTGCCCCTGACCCGCCCTGGGCAGCACCAACC
 CCCCTGCTCATGACGTCACCTCAGCGCCTGACAACAAGCCTAACGTGACGTC
 CGCTTCCGGCAGCGCCTCGGCTCAGCCTCCACACTGGTGATAACGGAACCT
 15 CCGCGCGGCCACCACCAACCCAGCGAGCAAGAGCACCCCTCTATCCCC
 TCCCACATAGCGACACACCCACCACGCTGGCCAGCCATAGCACCAAAACCGA
 CGCCTCTAGCACCCACCACCTCCACGGTGCCCCCTGACCTCCAGCAACCATT
 CTACCTCCCCCAGCTGTCCACGGGGTGAGCTTTTCTTCCTGTCCCTCCATA
 TCAGCAACCTCCAGTTCAATTCTCTGTGGAGGACCCAGCACCGACTACTACC
 20 AAGAGCTGCAGCGGGACATCTCGAGATGTTCTGCAGATCTACAAACAGGGC
 GGCTTCTGGATTGAGCAACATCAAGTCCGCCGGGTCCGTGGTGTGCA
 GCTCACCCCTGGCCTTCAGGGAGGGCACCATCAACGTGCATGACGTCGAGACCC
 AGTTCAATCAGTATAAGACCGAGGCCGCCTCCGGTACAACCTGACGATCAGC
 GACGTGTCTGTGTCCGACGTGCCCTTCCCTCTCCGCACAGTCCGGCGCCGG
 25 CGTCCGGGCTGGGCATCGCCCTGCTCGTGTGGTGTGCGTGCTCGTGGCC
 CTCGCCATCGTGTACCTGATCGCCCTGGCCGTCTGTCAGTGCAGGAGAAAGAA
 CTATGGGCAGTTGGATATCTTCCCCGCCAGGGACACCTACCACCCATGTCCG
 AGTACCCACCTACCACACCCACGGCCGCTATGTCCCTCCCTCGACCGAC
 CGCTCCCTTACGAGAAGGTGAGCGCCGGCAACGGAGGCAGCTCCCTGTCCCT
 30 ACACCAACCTGCCGTGGCCACAAGCGCCACACTGTAGATGACTCGAG
GGATCCCGCAG

Figure 5 – Final codon modified sequence of the MUC1 expression cassette containing the 7x VNTR fragment from JNW758. This cassette has a codon coefficient index of 0.699. Restriction sites are underlined, start and stop codons are bolded, the Kozak sequence is italicised, the BbvCI and BpI sites are boxed, and the 5 positions of the two silent mutations are double underlined.

GCTAGCGCCACCATGTCTAGAACCCCTGGCACCCAGTCCCCCTTTCTCCTG
 CTGCTGCTCACCGTGTGACCGTCGTGACCGGAGTGGCATGCGTCCTCGA
 CGCCCGGGCGAGAAGGAGACCAGTGCTACCCAGCGCAGCTGTGCCTTC
 10 CAGCACGGAGAAGAACGCTGTGAGTATGACTTCCTCCGTGCTGTCCCTCCATA
 GCCCCGGCTCGGGCAGCTCCACCACCCAGGGGAGGACGTGACACTGGCTCC
 CGCAACCGAGCCCGCCTCTGGCTTGCCGCCACCTGGGGCAGGACGTGACA
 TCCGTGCCCGTGACCCGCCCGCCCTGGGCAGCACCAACCCCCCTGCTCATG
 ACGTCACCTTCAGCCCCAGACAACAAGCCAGCCCCGGGCTCCACCGCCCCCCC
 15 AGCCCACGGTGTACCTCGGCCCCGGACACCAGGCCGGCCCCGGGCTCCACC
 GCCCCCCCAGCCCACGGTGTACCTCGGCCCCGGACACCAGGCCGGCCCCG
 GGCTCCACCGCCCCCCCAGCCCACGGTGTACCTCGGCCCCGGACACCAGGC
 CGGCCCCGGGCTCCACCGCCCCCCCAGCCCACGGTGTACCTCGGCCCCGGA
 CACCAGGCCGCCGGGCTCCACCGCCCCCCCAGCCCACGGTGTACCTCG
 20 GCCCCGGACACCAGGCCGCCGGGCTCCACCGCGCCCGCAGCCCACGGTGTACCTCG
 GTCACCTCGGCCCCGGACACCAGGCCGGCCCCGGCTCCACCGCCCCCAAG
 CCCACGGTGTACCTCGGCCCCGGACACCAGGCCGGCCCCGGCTCCACCGC
 CCCCCCAGCCCATGGTGTACCTCGGCCCCGGACAACAGGCCGCCCTGGC
 TCCACCGCCCCCTCCAGTCCACAATGTCACCTCGGCCCTCAGGCTCTGCATCAGG
 25 CTCAGCCTCCACACTGGTGCATAACGGAACCTCCGCGCGCCACCACCAACC
 CAGCGAGCAAGAGCACCCCTCTATCCCCTCCATCATAGCGACACACACC
 ACCACGCTGGCCAGCCATAGCACCAAAACGACGCCCTAGCACCCACCAC
 CACGGTCCCCCCCCTGACCTCCAGCAACCATTCTACCTCCCCCAGCTGTCCA
 CGGGGGTGAGCTTTCTTCCTGTCCCTCATATCAGCAACCTCCAGTTCAATT
 30 CCTCTCTGGAGGACCCAGCACCAGTACTACCAAGAGTTGCAGCGGGACATC
 TCCGAGATGTTCCCTGCAGATCTACAAACAGGGCGGCTTCCTGGGATTGAGCAA
 CATCAAGTTCCGCCCGGGTCCGTGGTGGTGCAGCTCACCTGGCCTTCAGG
 GAGGGCACCATCAACGTGCATGACGTGAGACCCAGTTCAATCAGTATAAGAC
 CGAGGCCGCTCCCGTACAACCTGACGATCAGCAGCTGTCTGTCCGAC
 35 GTGCCCTCCCCCTCTCCGCACAGTCCGGCGCCGGGTGCCGGCTGGGCA
 TCGCCCTGCTCGTGTGGTGTGCGTGTGCTGGCCCTGCCATCGTGTACCTG
 ATCGCCCTGGCCGTCTGTCAAGTGCAGGAGAAAGAAACTATGGGAGTTGGATAT
 CTTCCCCGCCAGGGACACCTACCAACCCATGTCCGAGTACCCCACCTACCACA
 CCCACGGCCGCTATGTCCCTCCCTCGACCGACCGCTCCCTACGAGAAAG
 40 GTGAGCGCCGGCAACGGAGGCAGCTCCCTGTCTACACCAACCCCTGCCGTGG
 CGGCCACAAGCGCCAACCTGTCAAGATGACTCGAG

Figure 6 – Comparison of expression of native MUC1 (JNW656) and codon modified MUC1 (JNW758) following transient transfection into CHO cells.

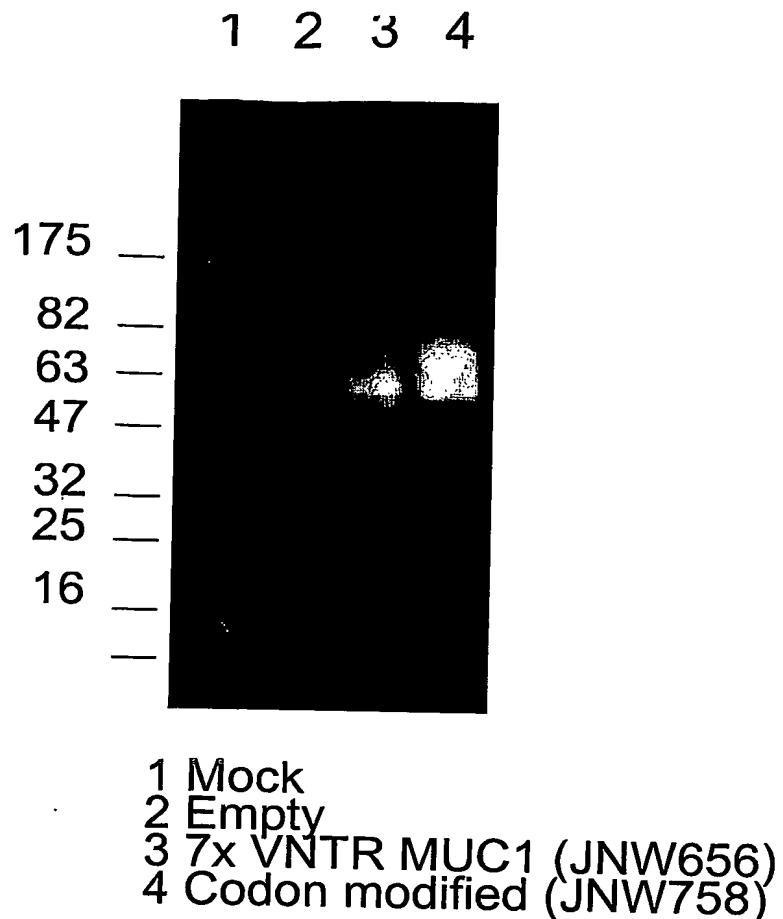


Figure 7 – Comparison of the IFN γ ELISPOT cellular responses following PMID immunisation with pVAC empty (control), 7x VNTR MUC1 (JNW656) and codon modified 7x VNTR MUC1 (JNW758). SAP is the CD8 MUC1 epitope SAPDNRPAL.

5 Each bar represents an individual mouse.

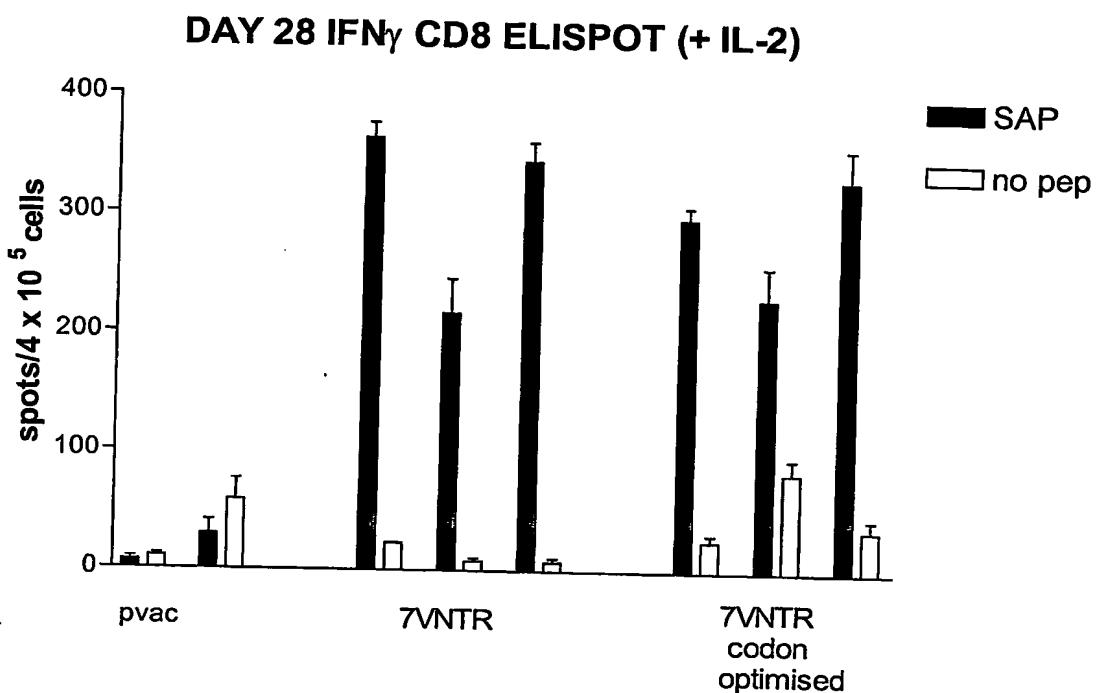


Fig 8. Comparison of the IL-2 ELISPOT cellular responses following PMID immunisation with PVAC 7 VNTR, PVAC 7 VNTR-PADRE-C (codon optimised sequence), PVAC 7 VNTR-PADRE-C (wt sequence), PVAC 7 VNTR-PADRE C/N' (codon optimised sequence) and PVAC empty (control). Responses were read using 5 SAP (CD8 T cell MUC1 peptide), 298/9 (CD4 T cell MUC1 peptide) and PADRE peptide. Analysis was performed at day 28 (A) and 49 (B).

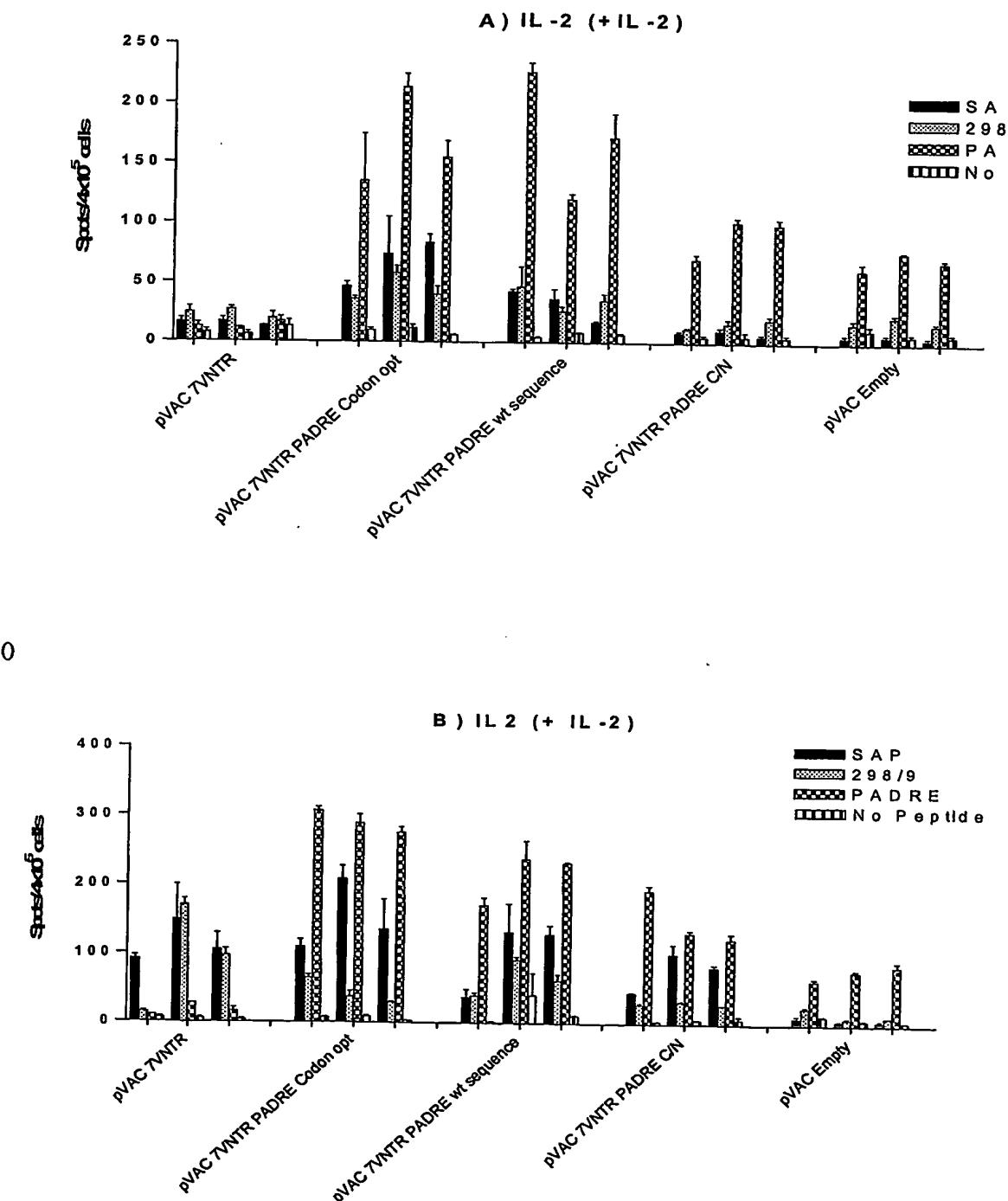


Figure 9**7x VNTR MUC1 (plasmid JNW656)**

Protein sequence

5 MSRTPGTQSPFFLLLLTVLTVVTGSGHASSTPGGEKETSATQRSSVPSSTEKN
 AVSMTSSVLSSHSPGSGSSTTQGQDVTLAPATEPASGSAATWGQDVTSVPVT
 RPALGSTTPPAHDVTSAPDNKPAPGSTAPPAHGVTsapdtrpapgstappaHG
 VTSAPDTRPAPGSTAPPAHGVTsapdtrpapgstappaHGVTsapdtrpapgs
 10 TAPPAHGVTsapdtrpapgstapaaHGVTsapdtrpapgstapqaHGVTsapd
 TRPAPGSTAPPAHGVTsapdNRPALGSTAPPVHNVTsASGSASGSASTLVHNG
 TSARATTPASKSTPFSIPSHSDTPTTLASHSTKTDASSTHHSTVPPLTSSNHS
 TSPQLSTGVSSFFLSFHISNLQFNSSLEDPSTDYYQELQRDISEMFLQIYKQGGF
 LGLSNIKFRPGSVVQLTLAFREGTINVHDVETQFNQYKTEAASRYNLTISDVS
 15 VSDVPFPFSAQSGAGVPGWGIALLVLVCVLVALAIVYLIALAVCQCRRKNYG
 QLDIFPARDTYHPMSEYPTYHTHGRYVPPSSTDSPYEKVSAGNGGSSLSYTN
 PAVAATSANLSR.

DNA sequence

20 ATGCTCTAGAACACCGGGCACCCAGTCCTCTTCTGCTGCTCCTCACAGTGCTTACAGTTGTTACAGGTTCTGG
 TCATGCAAGCTCTACCCCAGGTGGAGAAAAGGAGACTTCGGCTACCCAGAGAAGTTCAAGTGCCTCAGCTACTGAGAAGA
 ATGCTGTGAGTATGACCAGCAGCGTACTCTCCAGGCCACAGCCCCGGTTCAGGCTCCCTCCACCACCTCAGGGACAGGATGTC
 ACTCTGGCCCCGGCCACGGAACCCAGCTTCAGGTTCACTGCCACCTGGGACAGGATGTCACCTCGGTCCAGTCACCAG
 25 GCCAGCCCTGGGCTCCACCACCCCGCCAGCCCACGATGTCACCTCACGCCACAGGGCCGGGGCTCCACCGCCCCCGGCTCCACCG
 CCCCCCAGCCACGGTGTACCTCGGCCCCGGACACCAGGGCCGGGGCTCCACCGCCCCCGGACAGGCCCCCGGACACCAG
 ACCTCGGCCCCGGACACCAGGGCCGGGGCTCCACCGCCCCCGGACACCAGGGCCGGGGCTCCACCGCCCCCGGACACCAG
 GCCGGCCCCGGGCTCCACCGCCCCCGGACAGGCCACGGTGTACCTCGGCCCCGGACACCAGGGCCGGGGCTCCACCG
 CCCCCCAGCCACGGTGTACCTCGGCCCCGGACACCAGGGCCGGGGCTCCACCGCCCCCGGACAGCCACGGTGTACCTCGGCCCCGGACACCAG
 30 ACCTCGGCCCCGGACACCAGGGCCGGGGCTCCACCGCCCCCGGACACCAGGGCCGGGGCTCCACCGCCCCCGGACACCAG
 GCCGGCCCCGGGCTCCACCGCCCCCGGACACCAGGGCCGGGGCTCCACCGCCCCCGGACACCAGGGCCGGGGCTCCACCG
 CCCCTCCAGTCCACAATGTCACCTCGGCCCTCAGGCTCTGCATCAGGCTCAGCTTCTACTCTGGTGCACAACGGCACCTCT
 GCCAGGGCTACCACAACCCAGCCAGCAAGAGCACTCCATTCTCAATTCCAGCCACACTCTGATACTCCTACCCCT
 TGCCAGCCATAGCACCAAGACTGATGCCAGTAGCACTCACCACAGCAGGTACCTCCCTCTCACCTCTCCAAATCACAGCA
 35 CTTCTCCCAAGTTGCTACTGGGTCTCTTCTTCTGTCTTCACTTCAAACTCCAGTTAACTCTCT
 GAAGATCCCAGCACCAGACTACCAAGAGAGCTGCAGAGAGACATTCTGAAATGTTTGCAAGATTATAACCAAGGGGG
 TTTCTGGGCTCTCCAATATTAAGTCAGGCCAGGATCTGGTGTACAATTGACTCTGGCCTCCGAGAAGGTACCA
 TCAATGTCACGACGTGGAGACACAGTTCAATCAGTATAAAACGGAAGCAGGCTCTCGATATAACCTGACGATCTCAGAC
 40 GTCAGCGTGAATGATGTCCTGGTGCCTGGCCATTGCTATCTCATTGCTTGGCTGTCTGTCAGTGCAGGAAAGAACTACG
 GGCAGCTGGACATCTTCCAGCCGGATACTACCATCTATGAGCGAGTACCCACCTACCAACCCATGGCGCTAT

GTGCCCTAGCAGTACCGATCGTAGCCCTATGAGAAGGTTCTGCAGGTAATGGTGGCAGCAGCCTCTCTTACACAAA
CCCAGCAGTGGCAGCCACTTCTGCCAACTTGTCTAGATAG